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ABSTRACT

This paper discusses the different ways in which science can be taught, including reading of subject matter from a basal textbook and a hands-on approach in ongoing science lessons and units of study. The paper first points out that in 1996 the National Science Teachers Association came out with a set of standards for teachers to emphasize in teaching science and gives some examples for Grade 4. It next offers some strategies for teachers to use to help students in word recognition or silent reading of science content, such as use of context clues, phonics for the initial consonant of the unknown word, and common prefixes and common suffixes. The paper also recommends: the teacher writing new words on the chalkboard, discussion of relevant ideas read, peer teaching, cassette headphones to hear taped words; sequential peer reading, and a teacher aide reading subject matter aloud to students. It cites the following science skills and attitudes for students to achieve in the science curriculum: (1) ample opportunities to engage in experiments and demonstrations; (2) engagement in analytical thinking; (3) encouragement to do critical thinking; (4) development of scientific attitudes in ongoing science lessons; (5) a variety of resources should be used in data gathering; (6) ability to communicate science content effectively in oral and written communication; (7) listening skills for knowledge acquisition; (8) ability to classify knowledge; (9) development of curiosity; and (10) appreciation for the contributions of science and technology. (NKA)

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Reading, Science, and Hands On Learning.

by Marlow Ediger

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READING, SCIENCE, AND HANDS ON LEARNING

The author when supervising student teachers in the public schools noticed that science was taught in selected classrooms where reading of subject matter from a basal textbook seemingly was the major method used in teaching science. Pupils did much oral and silent reading of subject matter. Toward the other end of the continuum, selected student teachers and their cooperating teachers used a variety of methods of teaching including reading and a hands on approach in ongoing science lessons and units of study. Reading should be considered one important procedure among others, in teaching science. A variety of activities need to be stressed to provide for different learning styles and individual differences among learners. Science has its very own methodology and approaches in teaching.

The National Science Education Standards

The National Science Teachers Association (National Research Council, 1996) came out with a set of standards for teachers to emphasize in teaching science. The following are given as examples for teachers to stress in grade four:

Connecting to the Standards, Grade Four --- Content Standards K - 12 Unifying Concepts

* systems, order, and organization
* evidence, models, and explanation
* change, constancy, and measurement
* form and function

Content standards A: Science as Inquiry

* ability to do scientific inquiry
* understanding scientific inquiry

Content standard C: Life Science

* characteristics of organisms
* life cycles of organisms
* organisms and environment

Content Standard F. Science in personal nd social perspective

* characteristics and changes n population
* types of resources
* changes in environment
* science and technology in local challenges.

There is much reading from a variety of reference sources which pupils may do to understand the above named concepts.

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However, learners, need also to have each concept clarified with the use of a variety of learning opportunities so that meaningful learning does accrue. The learning opportunities include the concrete (science equipment, real objects and items), semiconcrete (illustrations, slides, video tapes, CD ROMS, DVDs, and reference books with pictures), and the abstract (reading, writing, listening, and speaking activities).

Hopefully, pupils will have garnered many skills in reading when science is taught, but this seemingly is too often not the case, from observations made by the author when supervising university student teachers in the public schools. Thus, if reading in science lessons and units of study is being emphasized, there is much the teacher can do to help pupils comprehend salient concepts and generalizations. The following might be used in assisting pupils in word recognition in silent or oral reading:

1. use of context clues. If a pupil cannot identify a word, he/she may be guided to attempt a word which makes sense in relationship to the other words in the sentence encountered. Too frequently, pupils will use a word for the unknown that is ridiculous. Certainly, a pupil can be helped to attempt words which are meaningful and do make sense in relationship to the rest of the words in the sentence. Sometimes this may not be adequate to identify the unknown word.

2. in addition to context clue use to identify the unknown word, the learner may use phonics for the initial consonant of the unknown word. Many consonants are quite consistent between symbol (grapheme) and sound (phoneme). The teacher needs to provide pupils with five seconds of time before using any approach in word recognition. This gives pupils time in attempting to identify any unknown word independently.

3. an unknown word might have the same/similar ending that a known word has which may guide pupils to identify the unknown word. This is especially true of rhyming words. Further clues to the correct identification of the unknown word might come from the ending letter or medial vowel sounds.

4. common prefixes need to be pointed out to the pupil in an unknown word. A common prefix, "ex" identified and removed from the unknown word may make it identifiable. The following common words contain the prefix "ex," ---- exit, export, exaggerate, excel, excellence, excuse, among many others.

5. common suffixes (such as "less", for example) noticed by the pupil and removed from an unknown word might also help pupils to identify a word: hopeless, childless, motherless, pointless, friendless, among others.

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Word recognition techniques are stressed to assist pupils to become independent readers. Each known word increases the sight vocabulary of the pupil. With an increased number of sight words, the pupil will then have a richer reading vocabulary to use in ensuing activities. The pupil needs to be flexible in knowing which technique to use, singularly or collectively, in word recognition.

The teacher may also write on the chalkboard, in neat manuscript letters, new words which pupils will meet up with in print discourse. Each of these words needs to be viewed carefully as they are being introduced by the teacher. Careful and accurate pronunciation of each new word by the teacher is a must! Each word needs to be used contextually orally by the teacher as well as with pupil involvement. As each word is being introduced, the teacher may use visuals to show meaning. Vocabulary development is salient. The visuals used also aides pupils to secure background information pertaining to the story to be read. By this time, pupils will have identified questions for which answers are needed and may come from reading the print discourse (Ediger, 2002, 6- 9).

After the oral/silent reading of the selection, pupils with teacher guidance may discuss relevant ideas read. There may be followup science experiences such a experimentation and demonstrations, project methods, art work, reading of library books on related topics, among others.

There are additional activities possible for pupils who do not read print discourse well:

1. peer teaching is possible with a fluent reader reading to others in a small group. Each pupil needs to observe carefully all words being pronounced.
2. cassette head phones are used to hear the taped words as well as the pupil following along as each word read aloud is being identified.
3. a pupil who reads well may assist those in class who have problems in word recognition.
4. peer reading in which pupils sequentially take turns reading science content aloud in a small group. The peer group may help those who need assistance in word recognition.
5. a teacher aide reading aloud to pupils in ensuing subject matter for an ongoing science lesson/unit of study (Ediger and Rao, 2003, Chapter Twelve).

There are selected science skills and attitudes which each pupil should achieve to do well in the science curriculum. First,

pupils should have ample opportunities to engage in doing experiments and demonstrations. Basal science textbooks within a unit of study do emphasize experimentation. These can be done in class. All pupils should be able to observe carefully what happens in these kinds of learning opportunities. Being a good observer is very salient in science. Science experiments should be conducted beyond those discussed in basal textbooks. Criticisms of basal science experiments have been that they are like a cookbook in that the directions are followed step by step such as in a recipe. There should then be additional experiments in which pupils identify a problem in the ongoing unit, obtain information in answer to the problem by using a variety of sources. An hypothesis is developed and tested within the experiment. The hypothesis may then be modified, revised or accepted. Science experiments conducted by pupils, if at all possible, and demonstrations given by teachers should be at the heart of the science curriculum.

Second, pupils should engage in analytical thinking individually as well as in small groups. Analyzing a statement stresses taking it apart to notice specifics therein, such as if objective thinking has been in evidence. Sometimes, a statement has incorrect assumptions or erroneous information. After the weaknesses have been taken out, a synthesis should result in putting objective subject matter information back together again.

Third, pupils need encouragement to do creative thinking. For example in hypothesizing about the outcomes of an experiment, pupils may give possible educated guesses with brain storming. These may be recorded on the computer with a large screen so that pupils do not duplicate on answers given. Generation of possible answers involves creativity. The longer, pupils are actively engaged in this activity, the more complex it becomes to provide additional unique answers.

Fourth, pupils need to develop scientific attitudes in ongoing lessons in science. Scientific attitudes involve objective thinking on the pupils part. Too frequently, biased thinking occurs which is accepted as fact. The pupil is to learn, instead, to view knowledge independently of the observer's feelings and prejudices. An open mind is kept on possible revisions to facts, concepts, and generalizations presently held.

Fifth, a variety of resources should be used in data gathering in the science curriculum. Developmental reading and nonreading sources need to be available. A good science laboratory is a necessity in science units of study. Pupils and the teacher may also bring needed materials for science experiments and demonstrations. Field trips and field studies as

well as knowledgeable resource personnel are needed in science teaching.

Sixth, pupils need to be able to communicate science content effectively in oral and written communication. Professional scientists are able to do this. Clarity in ideas expressed is very important. Coherence and appropriate sequence of ideas are musts! A good spelling vocabulary is needed in longhand and in word processor use. A variety of sentence patterns should be used to enrich writing and oral communication patterns. All mechanics in writing (proper punctuation, indentation of paragraphs, capitalization), among others, need stressing in the science curriculum. Appropriate stress, pitch, enunciation, and juncture need to be exhibited by the learner.

Seventh, pupils need to become good listeners in order to obtain knowledge and skills as well as become a quality committee and group member. Too frequently, a poor listener loses out on what has been said and then he/she fails to be a contributor to interact with others. The teacher needs to plan with pupils standards to follow in becoming a better listener. Evaluation in terms of these standards should occur rather frequently by pupils with teacher assistance to ascertain if the listening vocabulary is increasing.

Eighth, learners need to be able to classify knowledge. If pupils for example, are studying a unit on vertebrates, they should learn to classify animals in terms of being fish, amphibians, reptiles, birds, or mammals. Eras of time need to be classified as to Precambrian, Paleozoic, Mesozoic, or Cenozoic Era. The life sciences, earth sciences, and physical sciences contain a mass amount of information for which there are vital schemes of classification. Classification of knowledge brings order to what is being studied and acquired.

Ninth, curiosity is a very important trait to develop and/or maintain within individuals. The curious child learns much from the natural environment on his/her own as well as in the classroom setting. The classroom setting, for example, can be structured to increase pupil curiosity. When supervising university student teachers in the public schools, the author has noticed many pupils observing fish in an aquarium, tadpoles swimming in a jar, a garter snake in a terrarium, seeds from plants on an interest center, a leaf collection from diverse kinds of trees, and illustrated science books on a reading table, among others. Pupils do become interested in science through informal approaches and can learn much content on their very own.

Tenth, pupils need to appreciate the contributions of

science and technology as well as become life long learners. This statement, perhaps, is the major key to stress in education of pupils. It takes sequential achievement over along periods to truly become educated individuals (Ediger and Rao, 2001, Chapter Twenty).

In each of the above enumerated items above, much reading is emphasized and must be stressed across the curriculum.

References

National Research Council (1996), National Science Education Standards. Washington, DC: National Academy Press.

Ediger, Marlow (2002), "Scaffolding Reading Experiences," Edutracks, 1 (10), 6- 9.

Ediger, Marlow, and D. Bhaskara Rao (2003), Elementary Curriculum. New Delhi, India: Discovery Publishing House, Chapter Twelve.

Ediger, Marlow, and D. Bhaskara Rao (2001), Teaching Science Successfully. New Delhi, India: Discovery Publishing House, Chapter Twenty.

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